PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Kiyotomi Ogawa	**Examiner:**	Unassigned
Serial No:	10/091,893	**Art Unit:**	Unassigned
Filed:	March 6, 2002	**Docket:**	15345
For:	ENDOSCOPE SYSTEM	**Dated:**	May 31, 2002

Assistant Commissioner for Patents
United States Patent and Trademark Office
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

In connection with the above-identified patent application, kindly enter the following preliminary amendment.

IN THE SPECIFICATION:

Please replace the paragraph beginning at page 6, line 22, with the following rewritten paragraphs:

--Fig. 11A shows another example of a sectional contour line displayed as section information projected on the xz plane;

Fig. 11B shows another example of a sectional contour line displayed as section information projected on the yz plane;--

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CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8(a)

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231, on May31, 2002.

Dated: May 31, 2002

Mishelle Mustafa

Please replace the paragraph beginning at page 8, line 12, with the following rewritten paragraph:

--Fig. 1 to Fig. 15 are concerned with an embodiment of the present invention. Fig. 1 is an explanatory diagram schematically showing the configuration of an endoscope system capable of performing measurement. Fig. 2 is an explanatory diagram showing an imaging unit incorporated in the distal portion of an inserting section of an endoscope and a measuring device having an arithmetic unit. Fig. 3 shows a scene where an object-of-observation region is observed using an endoscope. Fig. 4 is a flowchart describing stereo measurement. Fig. 5 shows an example of an endoscopic image and a cutting-plane reference line displayed on the screen of a monitor by means of an image displaying means. Fig. 6 is an explanatory diagram concerning a cutting plane and a sectional contour line. Fig. 7 shows another example of a reference line. Fig. 8 shows an example of a sectional contour line displayed as section information. Fig. 9 is an explanatory diagram showing an example of a sectional contour line displayed while being superposed on a reference image. Fig. 10 is an explanatory diagram showing a camera coordinate system defined for presenting section information. Figs. 11A and 11B show another example of a sectional contour line displayed as section information. Fig. 12 shows another example of a sectional contour line displayed as section information. Fig. 13 shows still another example of a sectional contour line displayed as section information. Fig. 14 is a flowchart for explaining an algorithm for searching for a corresponding point. Fig. 15 is an explanatory diagram showing screen images displayed on the monitor after searching for a corresponding point is completed.--

Please replace the paragraph beginning at page 13, line 17, with the following rewritten paragraph:

--The CCU 31 having received the image signals produces video signals. The video signals are transferred to the video capture circuit 32 and converted into digital image signals. As shown in step S102, the digital image signals are transferred to the host computer 33, while the image signals are transferred to the monitor 30, whereby the endoscopic view images are displayed on the screen of the monitor 30, as shown in step S103.--

Please replace the paragraph beginning at page 20, line 2, with the following rewritten paragraph:

--As shown in Fig. 10, a camera coordinate system is defined as a coordinate system having an origin thereof aligned with the optical axis L of the optical system that picks up the reference image 50. Moreover, the x axis of the coordinate system is extended horizontally rightwards towards the object-of-observation surface 52, the y axis thereof is extended vertically upwards, and the z axis thereof is extended in a depth direction. Section information is projected on the xz plane shown in Fig. 11Aor the yz plane shown in Fig. 11B, whereby a contour line 57b or 57c outlining the section is displayed. In this display form, the same projection technique as the one employed in plotting a normal projection drawing can be adopted. It is therefore advantageous that a viewer accustomed to the projection technique for plotting a normal projection drawing can easily grasp the outline of a section. Note that coordinate axes or a plane of projection can be defined arbitrarily depending on a purpose of use.--

Please replace the paragraph beginning at page 21, line 13, with the following rewritten paragraph:

--As shown in Fig. 8 and Fig. 13, a distance from a point D1 to a point D2 is indicated with a line perpendicular to the reference segment 54 in the corrected reference image 50. The point D1 is a point on the surface of the object of observation 4 resulting from mapping of the point D on the reference segment 54 or reference line 53. The point D2 is a point on a line A1B1 linking points A1 and B1, which are points in real space resulting from mapping of the points A and B, resulting from mapping of the point D. The point D is set to all points lying along the reference segment 54 or reference line 53, whereby a contour line 57e outlining a section is displayed. According to this displaying technique, as described in the paragraph (1), an arrow mark C indicating the direction of a viewing point is displayed as a cue to learn the irregularity in the outline of a section. Incidentally, the sectional contour line 57e may be colored depending on the length of the segment D1D2 in order to provide the cue.--

Please replace the paragraph beginning at page 31, line 8, with the following rewritten paragraph:

--As shown in steps S702, S703, S704, and S705, it is judged whether the power change is equal to or larger than a threshold and thus detected whether the power has changed. If the power change is less than the threshold, the point of attention is disregarded. If the power change is equal to or larger than the threshold, the point of attention is adopted. In other words, only a corresponding point that is associated with a pixel contained in a domain whose power is judged to have changed is searched for. This processing is performed

as a step interposed between step S106 and step S107 described in Fig. 4. Step S107 and subsequent steps are performed only on adopted points of attention.--

<u>IN THE DRAWINGS</u>:

Attached is a "Request for approval of Drawing Changes" accompanying amended drawings showing the changes in red ink.

<u>REMARKS</u>

Applicants submit that the foregoing amendments to the specification and drawings made to correct certain typographical errors, do not introduce new matter into the application.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned **"<u>Version with Markings to Show Changes Made</u>".**

In view of the above, early and favorable consideration are respectfully requested.

Respectfully submitted,

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TS:cm
Encl. (Version with Markings to Show Changes Made and Request for Approval of Drawing Changes)

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Paragraph beginning at line 22 of page 6 has been amended as follows:

[Fig. 11 shows another example of a sectional contour line displayed as section linformation;]

Fig. 11A shows another example of a sectional contour line displayed as section information projected on the xz plane;

Fig. 11B shows another example of a sectional contour line displayed as section information projected on the yz plane;

Paragraph beginning at line 12 of page 8 has been amended as follows:

Fig. 1 to Fig. 15 are concerned with an embodiment of the present invention. Fig. 1 is an explanatory diagram schematically showing the configuration of an endoscope system capable of performing measurement. Fig. 2 is an explanatory diagram showing an imaging unit incorporated in the distal portion of an inserting section of an endoscope and a measuring device having an arithmetic unit. Fig. 3 shows a scene where an object-of-observation region is observed using an endoscope. Fig. 4 is a flowchart describing stereo measurement. Fig. 5 shows an example of an endoscopic image and a cutting-plane reference line displayed on the screen of a monitor by means of an image displaying means. Fig. 6 is an explanatory diagram concerning a cutting plane and a sectional contour line. Fig. 7 shows another example of a reference line. Fig. 8 shows an example of a sectional contour line displayed as section information. Fig. 9 is an explanatory diagram showing an example of a sectional contour line displayed while being superposed on a reference image. Fig. 10 is an

explanatory diagram showing a camera coordinate system defined for presenting section information. Figs. 11A and 11B show [Fig. 11 shows] another example of a sectional contour line displayed as section information. Fig. 12 shows another example of a sectional contour line displayed as section information. Fig. 13 shows still another example of a sectional contour line displayed as section information. Fig. 14 is a flowchart for explaining an algorithm for searching for a corresponding point. Fig. 15 is an explanatory diagram showing screen images displayed on the monitor after searching for a corresponding point is completed.

Paragraph beginning at line 17 of page 13 has been amended as follows:

The CCU 31 having received the image signals produces video signals. The video signals are transferred to the video capture circuit 32 and converted into digital image signals. As shown in step S102, the digital image [video] signals are transferred to the host computer 33, while the image signals are transferred to the monitor 30, whereby the endoscopic view images are displayed on the screen of the monitor 30, as shown in step S103.

Paragraph beginning at line 2 of page 20 has been amended as follows:

As shown in Fig. 10, a camera coordinate system is defined as a coordinate system having an origin thereof aligned with the optical axis L of the optical system that picks up the reference image 50. Moreover, the x axis of the coordinate system is extended horizontally rightwards towards the object-of-observation surface 52, the y axis thereof is extended vertically upwards, and the z axis thereof is extended in a depth direction. Section information is projected on the xz plane shown in Fig. 11A [(a)] or the yz plane shown in Fig. 11B [(b)], whereby a contour line 57b or 57c outlining the section is displayed. In this display

form, the same projection technique as the one employed in plotting a normal projection drawing can be adopted. It is therefore advantageous that a viewer accustomed to the projection technique for plotting a normal projection drawing can easily grasp the outline of a section. Note that coordinate axes or a plane of projection can be defined arbitrarily depending on a purpose of use.

Paragraph beginning at line 13 of page 21 has been amended as follows:

As shown in Fig. 8 and Fig. 13, a distance from a point D1 to a point D2 is indicated with a line perpendicular to the reference segment 54 in the corrected reference image 50. The point D1 is a point on the surface of the object of observation 4 resulting from mapping of the point D on the reference segment 54 or reference line 53 [54]. The point D2 is a point on a line A1B1 linking points A1 and B1, which are points in real space resulting from mapping of the points A and B, resulting from mapping of the point D. The point D is set to all points lying along the reference segment 54 or reference line 53, whereby a contour line 57e outlining a section is displayed. According to this displaying technique, as described in the paragraph (1), an arrow mark C indicating the direction of a viewing point is displayed as a cue to learn the irregularity in the outline of a section. Incidentally, the sectional contour line 57e may be colored depending on the length of the segment D1D2 in order to provide the cue.

Paragraph beginning at line 8 of page 31 has been amended as follows:

As shown in steps S702, S703, S704, and S705, it is judged whether the power change is equal to or larger than a threshold and thus detected whether the power has changed. If the power change is less [equal to or smaller] than the threshold, the point of attention is

disregarded. If the power change is equal to or larger than the threshold, the point of attention is adopted. In other words, only a corresponding point that is associated with a pixel contained in a domain whose power is judged to have changed is searched for. This processing is performed as a step interposed between step S106 and step S107 described in Fig. 4. Step S107 and subsequent steps are performed only on adopted points of attention.

IN THE DRAWINGS:

FIG. 11 has been replaced with the enclosed FIG. 11A and FIG. 11B.

FIG.10

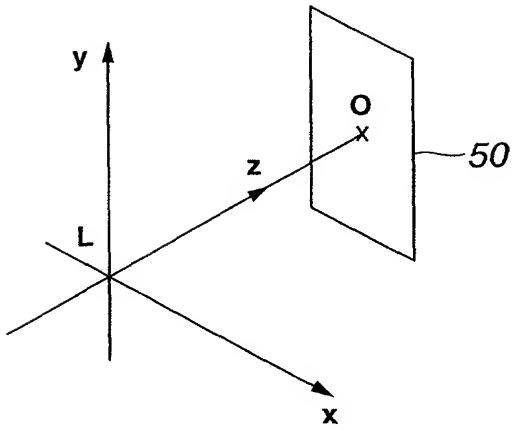

FIG.11A

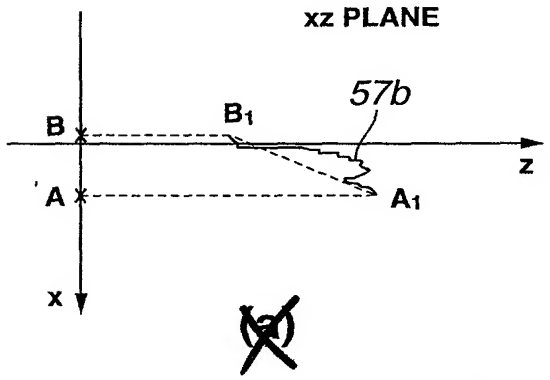

FIG. 11B